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**Self-organizing and stochastic behaviors during the regeneration of hair stem cells.**

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**Public Summary:**

Stem cells cycle through active and quiescent states. Large populations of stem cells in an organ may cycle randomly or in a coordinated manner. Although stem cell cycling within single hair follicles has been studied, less is known about regenerative behavior in a hair follicle population. By combining predictive mathematical modeling with in vivo studies in mice and rabbits, we show that a follicle progresses through cycling stages by continuous integration of inputs from intrinsic follicular and extrinsic environmental signals based on universal patterning principles. Signaling from the WNT/bone morphogenetic protein activator/inhibitor pair is coopted to mediate interactions among follicles in the population. This regenerative strategy is robust and versatile because relative activator/inhibitor strengths can be modulated easily, adapting the organism to different physiological and evolutionary needs.

**Scientific Abstract:**

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